

In the Claims

There is no amendment filed in connection with this response. The following list indicates the current status of claims as pending.

1. (original) A zoom camera for use with an electronic device, comprising:
 - a base member having an image sensor coupled thereto;
 - a guide cylinder member including at least two groups of linear guide grooves formed in a lengthwise direction of the guide cylinder member;
 - a driving motor for providing a rotational force;
 - a cam barrel coupled to an outer circumference of the guide cylinder member and including at least two groups of cam slots formed therein the cam barrel and the guide cylinder member adapted to provide a relative rotation with respect to each other in response to the rotational force of the driving motor;
 - at least two lens frames each having at least two linear guide portions radially extending outwards and respectively inserted in the corresponding linear guides grooves of the guide cylinder member for guiding the lens frames thereby, the lens frames having a plurality of cam pins radially extending outwards from the linear guide portions and respectively inserted in the corresponding cam slots of the cam barrel for guiding movement of the lens frames;
 - at least two lenses respectively fixed in the corresponding lens frames; and
 - a connector for connecting the zoom camera to the electronic device.
2. (original) The zoom camera as claimed in claim 1, wherein the driving motor is a DC driving motor.

3. (original) The zoom camera as claimed in claim 1, wherein a voltage signal waveform of a power applied to the driving motor is a pulse waveform having a portion for applying the power and a portion for not applying the power, and the power is applied within a time limit for moving the lenses between a full Tele zoom position and a full Wide zoom position.
4. (original) The zoom camera as claimed in claim 1, wherein the at least two groups of linear guide grooves of the guide cylinder member are formed at an interval of 120° around the guide cylinder member.
5. (original) The zoom camera as claimed in claim 1, wherein the cam barrel has three groups of cam slots, and two groups of the cam slots are inclined in the opposite direction to each other, and the other one group of the cam slots have a generally reversed V shape.
6. (original) The zoom camera as claimed in claim 1, wherein an allowance is formed between a first end portion of each of the cam slots and the corresponding cam pin when the cam barrel is in the Tele zoom state, and another allowance is formed between a second end portion of each of the cam slots and its corresponding cam pin when the cam barrel is in the Wide zoom state.
7. (original) The zoom camera as claimed in claim 1, wherein at least two lens shields are respectively affixed on their corresponding lenses for limiting an optical path and protecting the lenses.
8. (original) The zoom camera as claimed in claim 1 further including a gear train coupled to the base member, wherein the gear train comprises:

a motor gear connected to a rotation shaft of the driving motor;
at least one reduction gear to reduce the rotation speed of the driving motor; and
a transmission gear engaged with the at least one reduction gear and configured to rotate the cam barrel.

9. (original) The zoom camera as claimed in claim 8, wherein the gear train is inserted in a groove formed in an upper surface of the base member.

10. (original) The zoom camera as claimed in claim 1, wherein a filter is disposed in front of the image sensor.

11. (original) The zoom camera as claimed in claim 1, wherein the base member includes a module base and a lens guide base.

12. (original) The zoom camera as claimed in claim 1, wherein the base member includes a PCB on which the image sensor is disposed.

13. (original) The zoom camera as claimed in claim 11 further including a gear train coupled to the module base for rotating the cam barrel.

14. (original) The zoom camera as claimed in claim 13, wherein the gear train is mounted in a groove formed at one surface of the module base, and a filter is mounted in a groove formed at opposite surface of the module base such that the overall thickness of the zoom camera can be reduced.

15. (original) The zoom camera as claimed in claim 14, wherein the gear train mounting groove is formed at a location that does not overlap the filter mounting groove

formed at the opposite surface of the module base such that the overall thickness of the zoom camera can further be reduced.

16. (original) The zoom camera as claimed in claim 13, wherein the lens guide base is disposed above the module base and the guide cylinder member is coupled with the lens guide base.

17. (original) The zoom camera as claimed in claim 1, wherein the guide cylinder member is stationary and the cam barrel is rotatable relative to the guide cylinder member.

18. (original) The zoom camera as claimed in claim 1 further including a motor driving IC for driving the driving motor.

19. (original) The zoom camera as claimed in claim 1, wherein the base member includes a motor installation portion and the driving motor is mounted on the motor installation portion.

20. (original) The zoom camera as claimed in claim 19, wherein the motor installation portion includes at least one protrusion for limiting rotation of the cam barrel beyond a predetermined position.

21. (original) The zoom camera as claimed in claim 1, wherein the zoom camera has three lenses fixed in the corresponding lens frames.

22. (original) A cellular phone having a zoom camera incorporated thereto, the zoom camera comprising:

a base member having an image sensor coupled thereto;

a guide cylinder member including at least two groups of linear guide grooves formed in a lengthwise direction of the guide cylinder member;

a driving motor for providing a rotational force;

a cam barrel coupled to an outer circumference of the guide cylinder member and including at least two groups of cam slots formed therein the cam barrel and the guide cylinder member adapted to provide a relative rotation with respect to each other in response to the rotational force of the driving motor;

at least two lens frames each having at least two linear guide portions radially extending outwards and respectively inserted in the corresponding linear guides grooves of the guide cylinder member for guiding the lens frames thereby the lens frames having a plurality of cam pins radially extending outwards from the linear guide portions and respectively inserted in the corresponding cam slots of the cam barrel for guiding movement of the lens frames; and

at least two lenses respectively fixed in the corresponding lens frames.

23. (original) A portable digital device having a zoom camera incorporated thereto, the zoom camera comprising:

a base member having an image sensor coupled thereto;

a guide cylinder member including at least two groups of linear guide grooves formed in a lengthwise direction of the guide cylinder member;

a driving motor for providing a rotational force;

a cam barrel coupled to an outer circumference of the guide cylinder member and including at least two groups of cam slots formed therein the cam barrel and the guide

cylinder member adapted to provide a relative rotation with respect to each other in response to the rotational force of the driving motor;

at least two lens frames each having at least two linear guide portions radially extending outwards and respectively inserted in the corresponding linear guide grooves of the guide cylinder member for guiding the lens frames thereby the lens frames having a plurality of cam pins radially extending outwards from the linear guide portions and respectively inserted in the corresponding cam slots of the cam barrel for guiding movement of the lens frames; and

at least two lenses respectively fixed in the corresponding lens frames.

24. (original) A digital zoom camera comprising:

a module base having an image sensor therein;

an infrared ray shielding filter arranged in front of the image sensor in the module base;

a gear train inserted in a groove formed in an upper surface of the module base;

a lens guide base disposed on the module base and having a guide cylinder member integrally formed thereon, the guide cylinder member having at least two groups of linear guide grooves formed in a lengthwise direction thereof;

a driving motor mounted on the lens guide base to rotate the gear train; a cam barrel rotatably coupled at an outer side of the guide cylinder member and having a cam barrel gear portion engaged with the gear train and at least two groups of cam slots formed around the cam barrel;

at least two lens frames each having at least two linear guide portions radially extending outwards and respectively inserted in the corresponding linear guide grooves of the guide cylinder member for guiding the lens frames thereby, the lens frames

having a plurality of cam pins radially extending outwards from the linear guide portions and respectively inserted in the corresponding cam slots of the cam barrel for guiding movement of the lens frames; and

at least two lenses respectively fixed in their corresponding lens frames.

25. (previously presented) A digital zoom camera comprising:

a module base having an image sensor coupled thereto;

a gear train mounted on the module base;

a driving IC for controlling a driving motor;

a lens guide base disposed on the module base and having a guide cylinder member disposed thereon, the guide cylinder member including a linear guide groove formed in a lengthwise direction thereof;

the driving motor mounted on the lens guide base to rotate the gear train;

a cam barrel rotatably coupled at an outer side of the guide cylinder member and having a cam barrel gear portion engaged with the gear train and at least two cam slots formed around the cam barrel;

at least two lens frames each including a linear guide portion radially extending outwards and inserted in the corresponding linear guide groove of the guide cylinder member for guiding the lens frames thereby, each of the lens frames including a cam pin radially extending outwards from the linear guide portion and inserted in the corresponding cam slot of the cam barrel for guiding movement of the lens frames; and

at least two lenses respectively fixed in their corresponding lens frames.